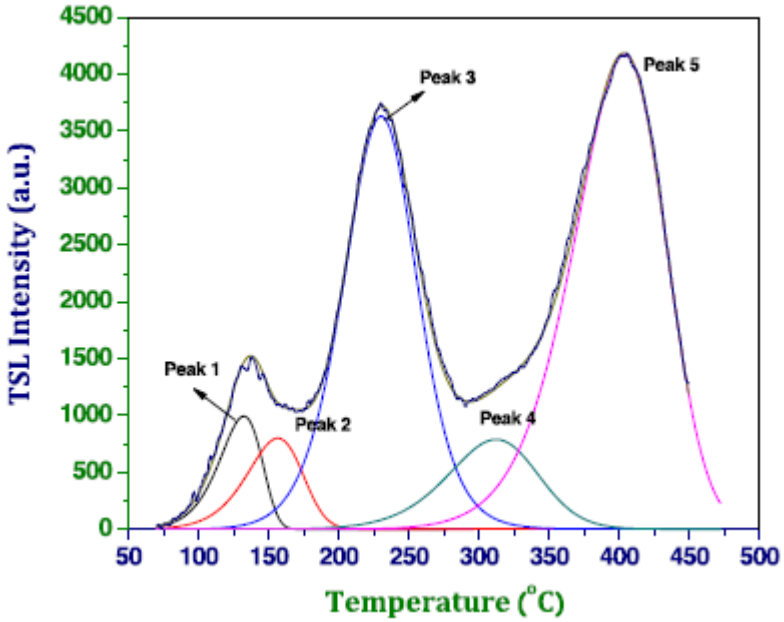
Thermal Cleaning (peak separation)

Overlapping peaks

→sample is heated to appropriate incremental intermediate temperatures.

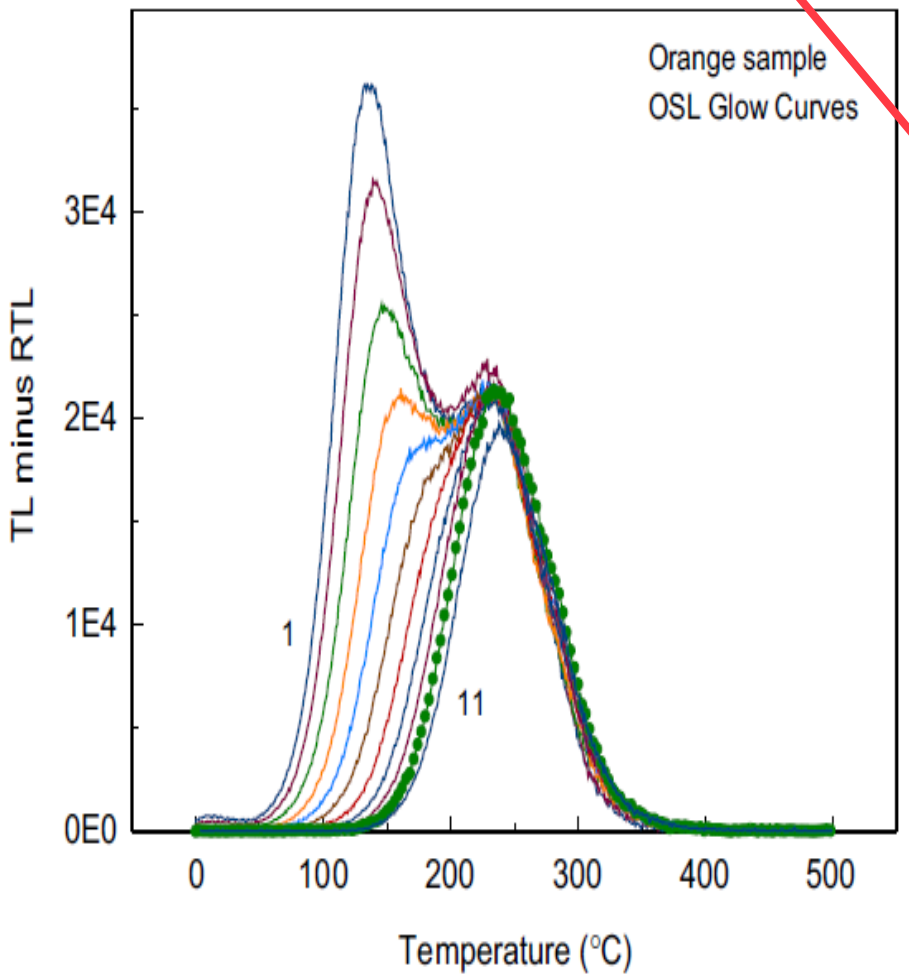
This technique is used when the energy activation E has to be determined by the initial rise method where a clean initial rise the peak is needed.

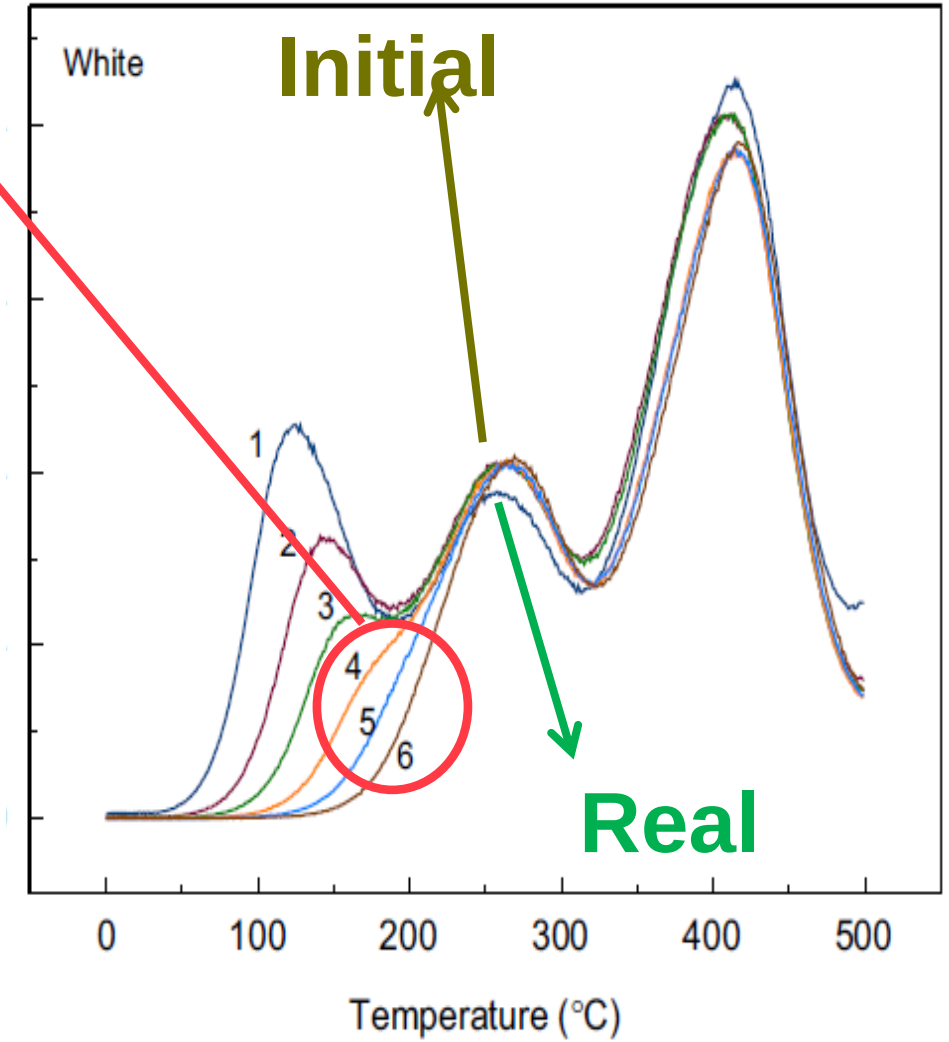


Thermal cleaning allows to determine the temperature of the maximum, T_{max}, but not the intensity at the maximum because the cleaning thermal treatment could affect the number of the trapped charges.

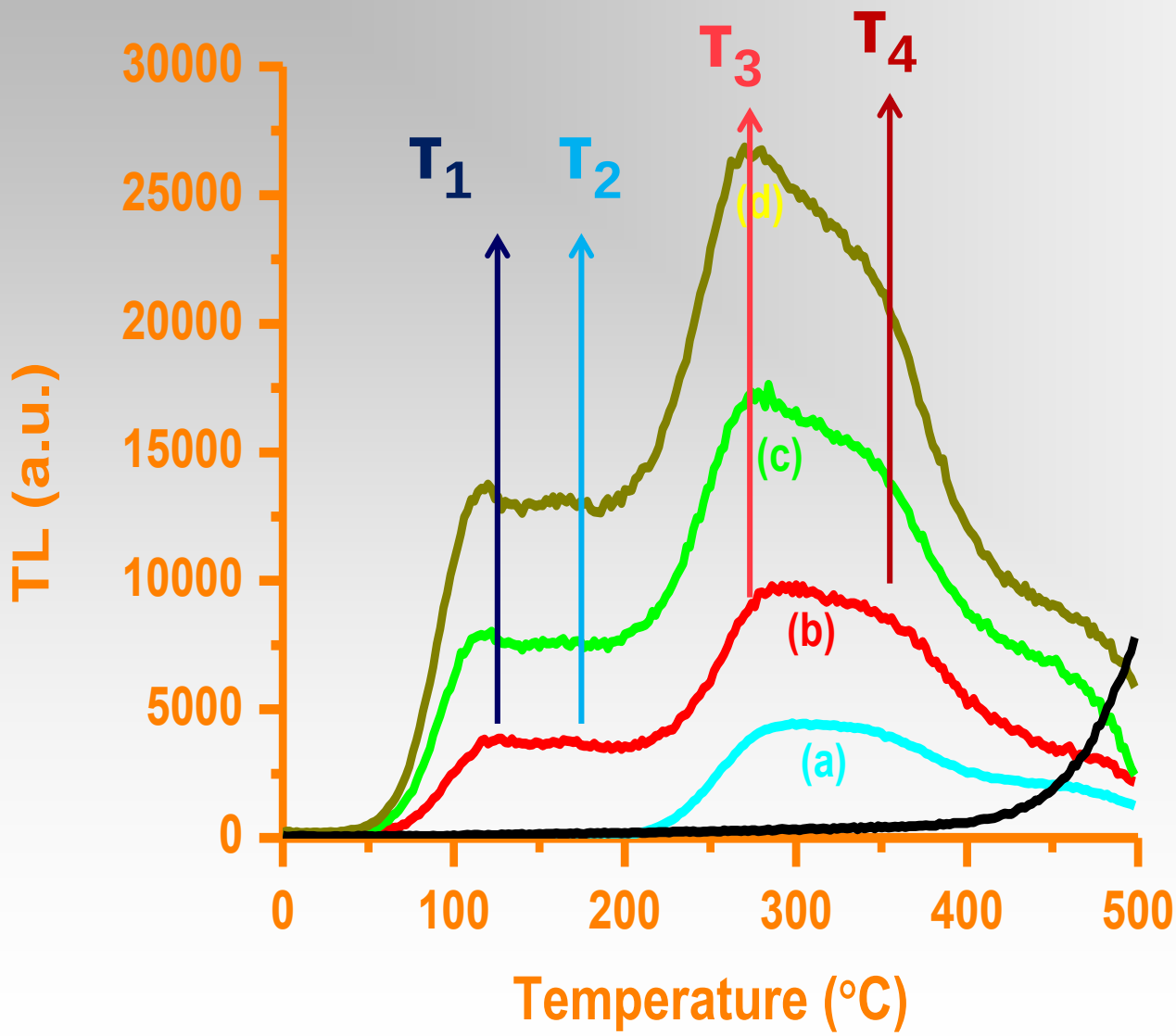
Thermal Cleaning (peak separation)

Checking linearity of ln(TL) vs 1/kT plot



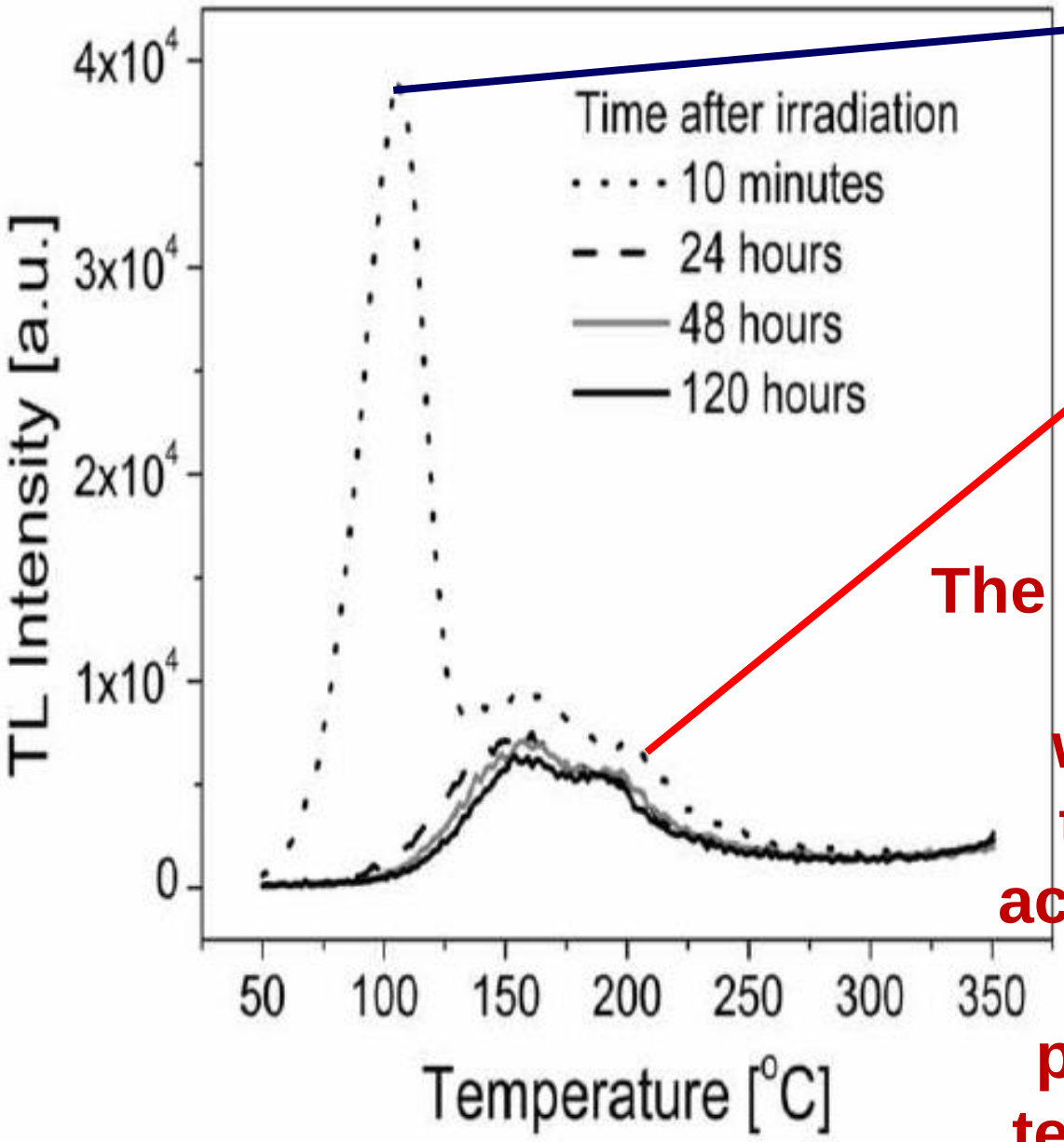


Thermal fading



- $T_1 < T_2 < T_3 < T_4$
- **The decrease of the TL peak's intensity according to the expected kinetic models and life times of traps**

Anomalous fading

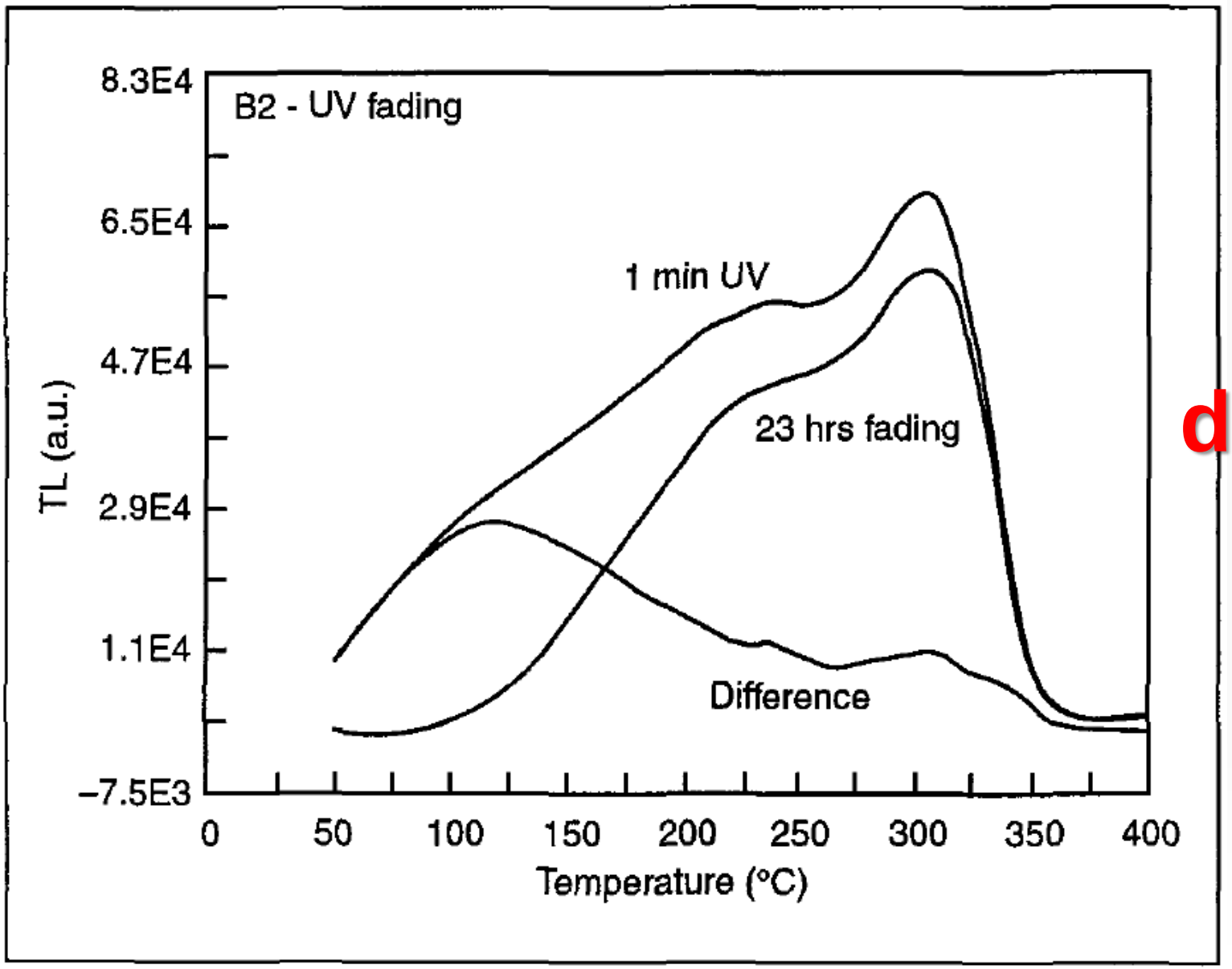


τ_1 ~ 1-2 hours

τ_2 ~ 5 years

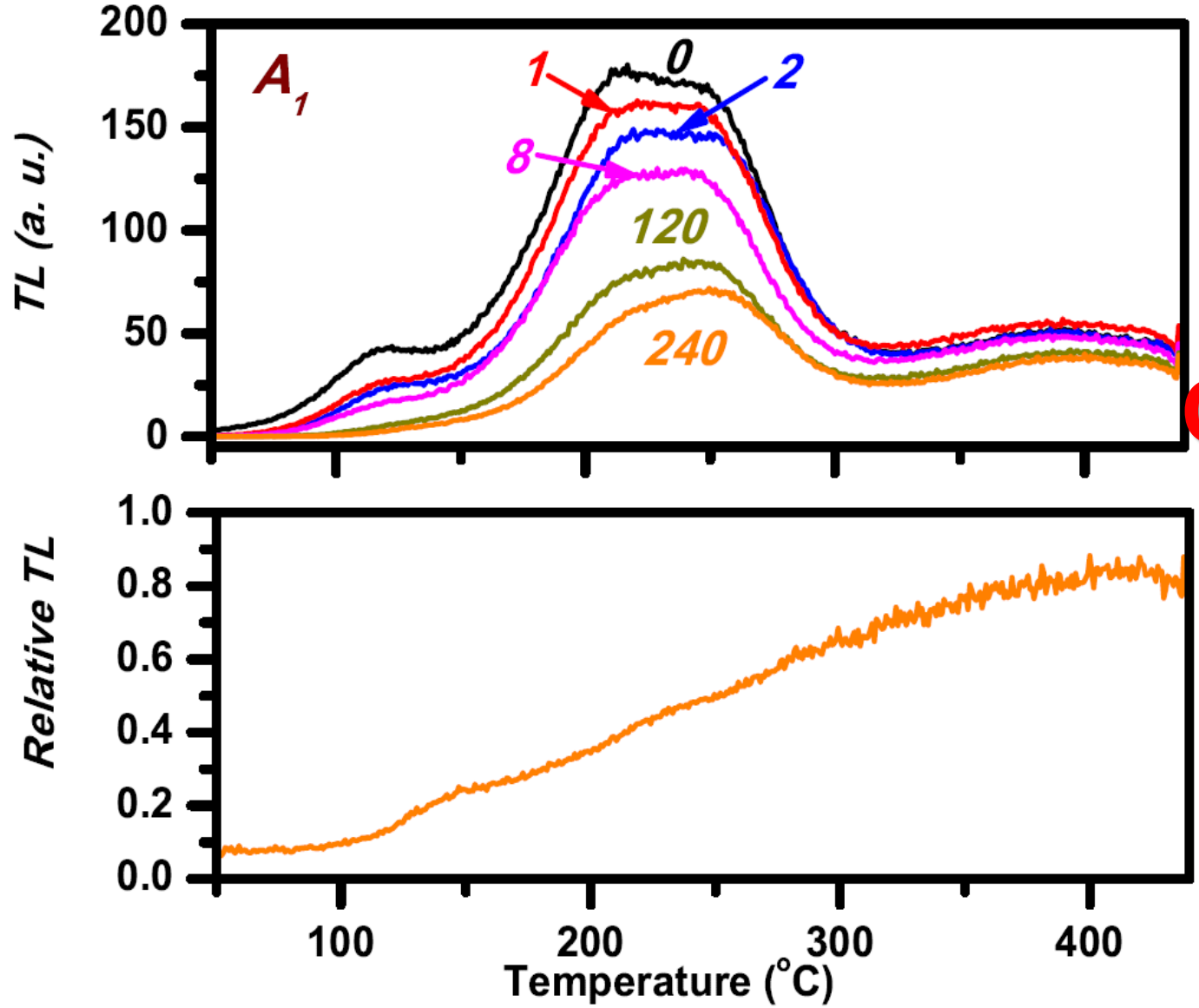
The charges are released by the trap at a rate which is much faster than those expected according to the lifetime of the trap while the phenomenon is wekly temperature dependent

Anomalous fading: examples



CVD diamond

Anomalous fading: examples

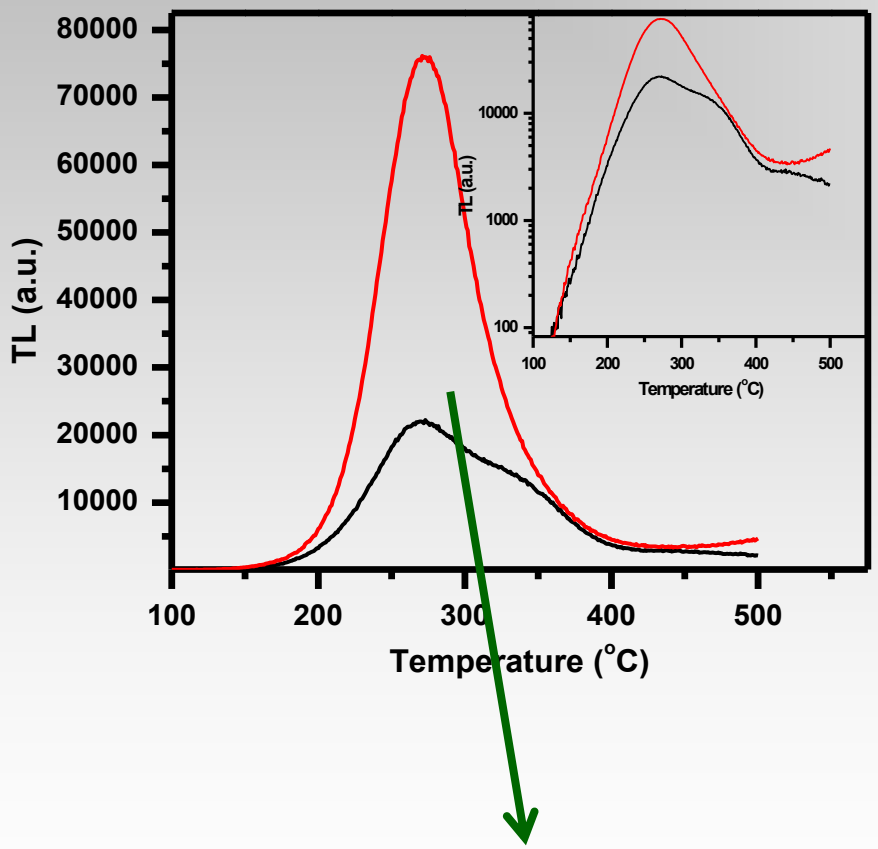


Fluor-apatite

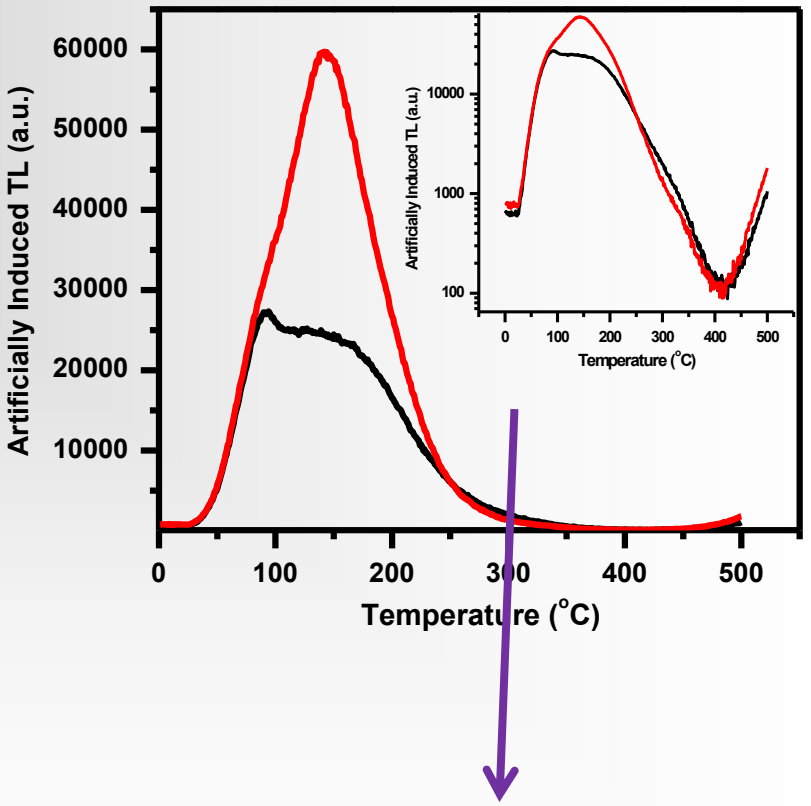
$Ca_5(PO_4)_3F$

The anomalous fading is observed in natural minerals, as well as in TL materials as ZnS:Cu, ZnS:Co, CaF_2:Mn, KCl:Tl, etc.

But mostly feldspars ($x[AlSi_3O_8]$, x = K, Na, Ca)



$KAlSi_3O_8$



$NaAlSi_3O_8$

Tunnelling

An electron trapped in a level A of an atom (Fig.6) may recombine directly with a hole in a level B of another atom without involving the delocalized bands. Mikhailov gave in 1971 a model for tunnelling process [1-3].

The defects responsible for levels A and B must be closed to each other. This can occur when traps and recombination centers are in a very high concentration and when the two centers belong to the same defect site. This transition occurs through the potential barrier (tunnelling) which separates the electron in A from the hole in B. The recombination results in the emission of luminescence. The effect is athermal.

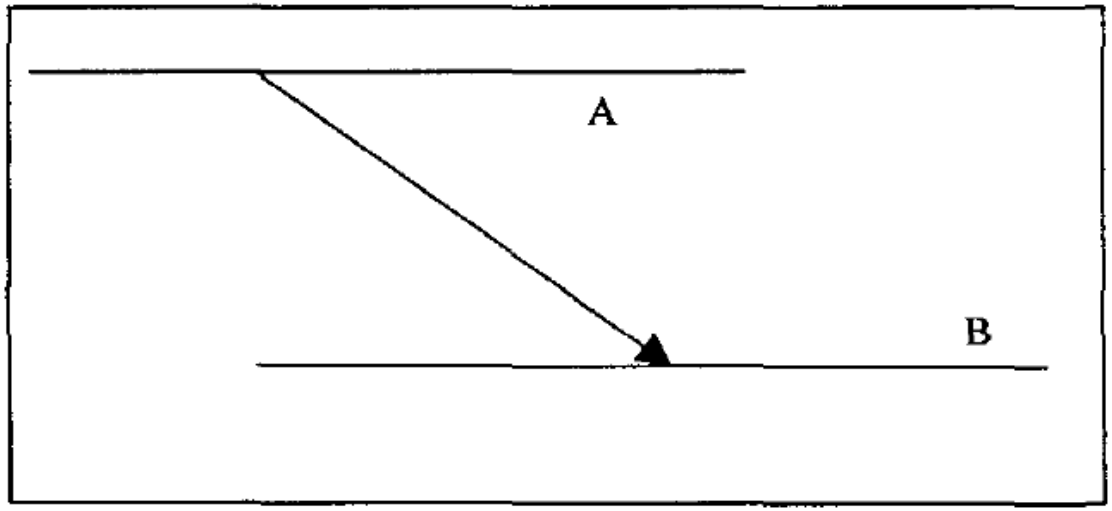
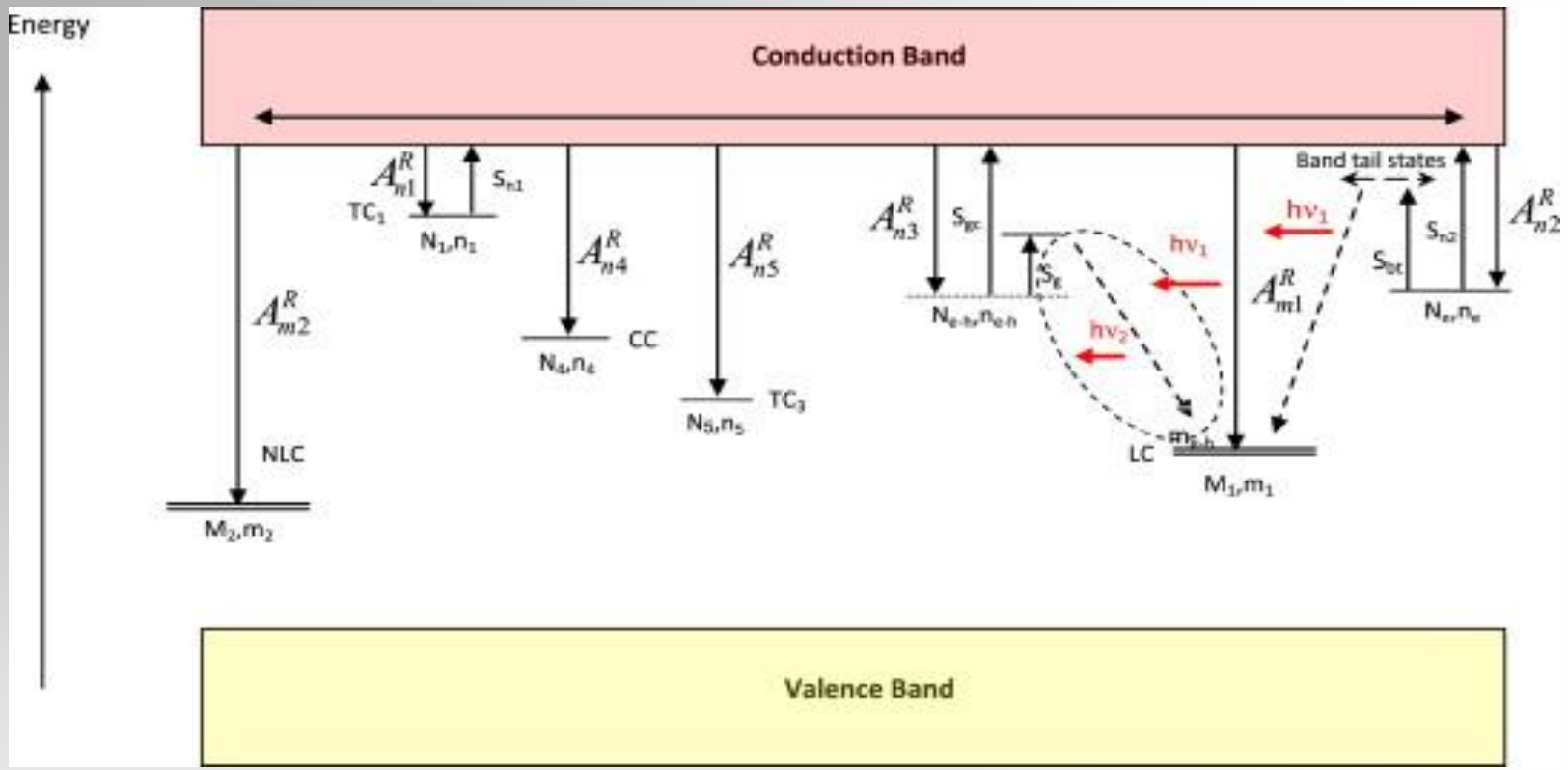


Fig.6. Tunnelling between an electron in A and a hole in B.



I. Eliyahu , Y.S. Horowitz , L. Oster , S. Druzhyna , I. Mardor

Nanodosimetric kinetic model incorporating localized and delocalized recombination: Application to the prediction of the electron dose response of the peak 5a/5 ratio in the glow curve of LiF:Mg,Ti (TLD-100)

Radiation Measurements, 2014

http://dx.doi.org/10.1016/j.radmeas.2014.01.015